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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/755,572	01/08/2001	Ting Cheong Ang	CS99-224	3795

7590 06/05/2002

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EXAMINER

FOONG, SUK SAN

ART UNIT	PAPER NUMBER
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2823

DATE MAILED: 06/05/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/755,572

Applicant(s)

ANG ET AL.

Examiner

Suk-San Foong

Art Unit

2823

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-20 is/are pending in the application.
- 4a) Of the above claim(s) 14-20 is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1-13 is/are rejected.
- 7) ☐ Claim(s) 6, 7, 12 and 13 is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on ____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on ____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. ____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 2.
- 4) ☐ Interview Summary (PTO-413) Paper No(s) ____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other:

DETAILED ACTION

Election/Restrictions

1. Applicant's election with traverse of Group II, claims 1-13, in Paper No. 4 is acknowledged. The traversal is on the ground(s) that the inventions are the necessity to obtain claims in both the product and method claim language, the method claims necessarily use the product and vice versa, the fields of search for Group I and Group II inventions are clearly and necessarily co-extensive, and the suggestion is speculative and really has nothing to do with the claims as presented. This is not found persuasive because fields of search for the invention of Group I and Group II are not co-extensive which is an evidence of serious burden and applicants have not provide a convincing argument that the alternative method stated in the office action mailed 12/21/01 would not be capable of providing the device of Group I.

The requirement is still deemed proper and is therefore made FINAL

Drawings

2. The drawings are objected to as failing to comply with 37 CFR 1.84(p)(5) because they do not include the following reference sign(s) mentioned in the description: ILD layer "36" on instant page 9, line 1. A proposed drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

Claim Objections

Art Unit: 2823

3. Claims 6 and 12 are objected to under 37 CFR 1.75(c), as being of improper dependent form for failing to further limit the subject matter of a previous claim. Applicant is required to cancel the claim(s), or amend the claim(s) to place the claim(s) in proper dependent form, or rewrite the claim(s) in independent form. The steps recited in claims 6 and 12 are achieved by the steps of claim 1, lines 27-28 and claim 8, lines 29-29, respectively.

4. Claims 7 and 13 are objected to under 37 CFR 1.75(c), as being of improper dependent form for failing to further limit the subject matter of a previous claim. Applicant is required to cancel the claim(s), or amend the claim(s) to place the claim(s) in proper dependent form, or rewrite the claim(s) in independent form. It is not clear how trench provides contact to silicon layer to eliminate floating body effects. It appears that second contact opening is between the first trench and one of the second trenches.

Claim Rejections - 35 USC § 112

5. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

6. Claims 4, 5, 7, 10 and 11 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Art Unit: 2823

7. Claims 4, 5, 10 and 11, it appears that "containing" should be replaced by--consisting of--

Claim Rejections - 35 USC § 103

8. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

9. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

10. Claims 1-13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kunikiyo ('087) in combination with Chen et al. ('941) and Wolf.

Kunikiyo teaches a method of forming a semiconductor device with SOI structure which includes providing silicon substrate 113 (Col. 1, line 31 and lines 41-43, and Figs. 16 and 20), forming oxide layer 114 over substrate 113 (Col. 1, line 29), then forming silicon layer 115 over

Art Unit: 2823

oxide layer 114 (Col. 1, line 31), etching silicon layer 115 to form first trench 116 (Fig. 16) and filling with insulating layer (Col. 2, lines 6-16), etching silicon layer 115 to form second trenches 150 (Fig. 16) filling with insulating layer (Col. 1, lines 44-49), then forming gate electrode 119 and source and drain regions 124 on silicon layer 115 (Fig. 16 and Fig. 4), then forming interlevel insulating layer 127 (Fig. 16, and Col. 3, lines 27), forming first contact plugs 131 and 129 through interlevel insulating layer 127 to source and drain regions 124 (Fig. 4, and Col. 3, lines 2-4), and forming second body contact 135 between first trench 116 and one of second trenches 150 (Fig. 16).

In view of the disclosure that a via opening is formed to expose substantially all of the substrate between the first trench and one of the second trenches it would have been obvious to one ordinarily skilled in the art to expose the entire substrate because such a step would enable formation of a contact. Note that the contact 135 contacts substantially all of the substrate as depicted in Fig. 16.

With respect to claims 3 and 9, Kunikiyo does not teach that trenches are filled with a liner oxide and a gap-filling oxide layer.

Chen et al. disclose a method of forming trench isolation on SOI substrate which includes forming silicon substrate 52 of SOI structure (Col. 3, lines 10-12), then sequentially depositing pad oxide layer 62 and silicon nitride layer 64 to form hard mask for subsequent etching process (Col. 3, lines 12-14), then etching silicon substrate 52 to form trench 54 (Col. 3, lines 18-21 and Fig. 3), then forming silicon dioxide liner layer 72 in trench 54 (Col. 3, lines 34-38, and Fig. 4), and filling trench 54 with insulating material 74 (Col. 3, lines 62-65) such as oxide (Col. 2, lines 44-46).

It would have been within the scope to one ordinary skill in the art to combine the teachings of Kunikiyo and Chen et al. because it would enable formation of insulated trenches 116 and 150 by depositing liner oxide and gap-filling oxide material in trench openings and to obtain further advantages of effective corner-rounding and improved gap filling ability (Chen et al., Col. 4, lines 12-16)

The choice of trench depth would be a matter of routine optimization to achieve the desired device dimensions and the desired device characteristics of the device to be formed. (See MPEP 2144.05)

With respect to claims 4 and 10, Kinikiyo does not teach the recited interlevel insulating layer materials.

Wolf teaches a method forming interlevel dielectric layers in semiconductor device which includes providing dielectric layer consisting of TEOS material (page 194) over metal or polysilicon layers.

It would have been within the scope to one ordinary skill in the art to combine the teachings of Wolf with combination of Kunikiyo and Chen et al. because it would enable formation of interlevel insulating layer 127 of Kunikiyo and to obtain further advantage of excellent step coverage (page 194).

The choice of thickness of interlevel dielectric layer would be a matter of routine optimization to achieve the desired device dimensions and the desired device characteristics of the device to be formed. (See MPEP 2144.05)

With respect to claims 5 and 11, Kunikiyo does not teach that conducting layer is comprised of tungsten or aluminum-copper alloys.

Art Unit: 2823

Wolf discloses an array of conductive materials for forming contacts between interlevel insulating layers which includes filling contact holes and vias with tungsten (page 192).

It would have been within the scope to one ordinary skill in the art to combine the teachings of Wolf with combination of Kunikiyo and Chen et al. because it would enable formation of contact plugs 131 and 129 of Kunikiyo to be performed.

Conclusion

11. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Suk-San Foong whose telephone number is 703-305-0383. The examiner can normally be reached on Monday to Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wael Fahmy can be reached on 703-308-4918. The fax phone numbers for the organization where this application or proceeding is assigned are 703-308-7722 (7724, 3431, 3432).

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0956.

Application/Control Number: 09/755,572

Page 8

Art Unit: 2823

SF

June 3, 2002

A handwritten signature in black ink, appearing to read "George Fourson".

George Fourson
Primary Examiner
Art Unit 2823